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LATHAM & WATKINS

ATTORNEYS AT LAW

1001 PENNSYLVANIA AVE., N.W., SUITE 1300

WASHINGTON, D.C. 20004-2505

TELEPHONE (202) 637-2200

FAX (202) 637-2201

TLX 590775

ELN 62793269

PAUL R. WATKINS (1899-1973)

DANA LATHAM (1898-1974)

CHICAGO OFFICE
SEARS TOWER, SUITE 5800
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 876-7700
FAX (312) 993-9767

LONDON OFFICE
ONE ANGEL COURT
LONDON EC2R 7HJ ENGLAND
TELEPHONE + 44-71-374 4444
FAX + 44-71-374 4460

LOS ANGELES OFFICE
633 WEST FIFTH STREET, SUITE 4000
LOS ANGELES, CALIFORNIA 90071-2007
TELEPHONE (213) 485-1234
FAX (213) 891-8763

MOSCOW OFFICE
113/1 LENINSKY PROSPECT, SUITE C200
MOSCOW 117198 RUSSIA
TELEPHONE + 7-503 956-5555
FAX + 7-503 956-5556

NEW YORK OFFICE
885 THIRD AVENUE, SUITE 1000
NEW YORK, NEW YORK 10022-4802
TELEPHONE (212) 906-1200
FAX (212) 751-4864

ORANGE COUNTY OFFICE
650 TOWN CENTER DRIVE, SUITE 2000
COSTA MESA, CALIFORNIA 92626-1925
TELEPHONE (714) 540-1235
FAX (714) 755-8290

SAN DIEGO OFFICE
701 "B" STREET, SUITE 2100
SAN DIEGO, CALIFORNIA 92101-8197
TELEPHONE (619) 236-1234
FAX (619) 696-7419

SAN FRANCISCO OFFICE
505 MONTGOMERY STREET, SUITE 1900
SAN FRANCISCO, CALIFORNIA 94111-2562
TELEPHONE (415) 391-0600
FAX (415) 395-8095

February 3, 1994

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

BY HAND DELIVERY

William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

Re: PR Docket No. 93-61: Automatic Vehicle Monitoring Systems

Dear Mr. Caton:

Pursuant to Section 1.1206(a)(2) of the Commission's Rules, this letter serves as notice of an ex-parte communication in the above-referenced proceeding. Today, on behalf of Hughes Transportation Management Systems ("Hughes"), Nicholas W. Allard and Jonathan Miller of this office, along with the undersigned, met with Karen Brinkmann and Diane Cornell of Chairman Hundt's office to discuss Hughes' Automatic Vehicle Monitoring technology and the views of Hughes expressed in its comments and reply comments in this proceeding. The attached materials were provided and used during the meeting.

Please contact the undersigned if there are any questions regarding this matter.

Respectfully submitted,

Raymond B. Grochowski

Raymond B. Grochowski
of LATHAM & WATKINS

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List A B C D E

HUGHES TRANSPORTATION MANAGEMENT SYSTEMS' VEHICLE TO ROADSIDE COMMUNICATIONS SYSTEM

Hughes Transportation Management Systems ("HTMS") has developed, and is now deploying, a Location and Monitoring Service system which is called Vehicle to Roadside Communications ("VRC"). A basic VRC system employs a base station, or "reader," and tags mounted on the vehicles or other objects to be monitored. A reader generally consists of a transmitter, receiver and antenna installed at the side of the highway segment to be monitored. Each tag contains a low power transponder that receives interrogation or information signals transmitted by the reader and responds by emitting an identification signal that is picked up by the reader. HTMS's VRC is a local-area system that can operate effectively in the 912-918 Mhz band.

For spectral efficiency, VRC technology uses sophisticated time-sharing techniques that enable a single reader to differentiate between and accurately process a large number of responsive signals in a short period of time. Thus, a VRC reader can interrogate, identify and exchange two-way information with every vehicle in a multi-lane environment using only a single reader, operating on a single frequency, even at high speeds. This will reduce construction and maintenance costs in high-traffic density areas such as toll-plazas and major highway intersections. Multiple VRC readers can be connected to networks for data processing and monitoring at central control points, and tags can be connected to in-vehicle information display equipment. In addition, VRC provides a signal authentication capability to prevent system abuse.

HTMS's VRC projects represent a flexible and innovative approach to meeting the transportation capacity, safety and efficiency goals established in the Intelligent Vehicle-Highway Systems Act of 1991 ("IVHSA"). By establishing an effective and reliable communications link between moving vehicles and the surrounding infrastructure, HTMS's VRC will be used to promote such IVHSA priorities as automated toll collection, vehicle location and tracking, traffic monitoring and rerouting, and emergency and services availability message dissemination. HTMS's VRC also offers the potential for commercial applications such as automated parking fee assessment and shipping vessel tracking, and is therefore an example of effective transfer of sophisticated communications technology from the aerospace and defense industries to the private sector.

HTMS has recently been awarded a contract to install a network of VRC facilities along Interstate 75, from Florida through Michigan, and along Canada Highway 401 in Ontario. This network will consist of VRC readers, deployed in the vicinity of truck weighing stations, and tags mounted in commercial trucks. As trucks pass through the monitored segment of highway, readers will interrogate tags and transmit individualized messages informing drivers whether they are required to get their trucks weighed at the next weighing station. Drivers informed that they need not stop for weighing will thus avoid unnecessary delay caused by highway exit and reentry and waiting in line at truck scales. By expediting commercial truck movement along this major traffic corridor, the HTMS VRC network will benefit trucking firms, U.S. and Canadian authorities, and the citizens of both countries.

HTMS is also planning for VRC system installations that will improve highway utilization by collecting tolls in an open-road environment, without the need for toll plazas. Additionally, HTMS soon will implement a bus annunciator system using VRC to facilitate public transit agency compliance with the Americans with Disabilities Act, by facilitating use of public transportation by persons that are sight-impaired.

ADVANTAGE I-75

Advantage I-75 is a multiple-state system for commercial truck weight monitoring and trip delay reduction. Advantage I-75 will employ Hughes Aircraft Company's Vehicle Roadside Communications ("VRC") system to transmit information between commercial trucks and the roadside control points in the vicinity of highway weigh stations.

VRC is designed to address the needs of Intelligent Vehicle/Highway Systems for two-way vehicle-to-infrastructure communications. The VRC system consists of fixed base roadside readers and numerous mobile transponders mounted in vehicles. For simple applications, VRC is used as a stand-alone reader/ transponder link, but may be connected to host systems at either reader or transponder (or both) for more advanced applications. Each transponder has the ability to transmit vehicle identification and status to an interrogating reader. The communication zone of the local area VRC has a maximum separation distance between reader and transponder ranging from approximately 6 ft to 150 ft, depending on the exact equipment configuration and application.

A reader repetitively transmits a message seeking acknowledgment from a transponder that may be entering the zone of communication. When a transponder enters the zone, communication is established in accordance with the link protocol, transponder identification is transmitted to the reader, and data are transmitted either to or from (or both) the transponder. A transponder transmits only within the local area communication zone. Both reader and transponder emissions have a bandwidth of 6 MHz centered at 915 MHz.

For Advantage 1-75, all mobile transponders are to be installed in commercial trucks, and VRC will be used to automate truck weight regulation enforcement. In total, Advantage I-75 will support the operation of 22 weigh stations along Interstate 75 in the United States and 8 stations along Highway 401 in Ontario, Canada, as shown on the attached map. Each weigh station incorporates either three or four readers for each of one or two directions of travel, depending on the configuration of the station. Each reader has a data communication interface with the station host computer. The communication zone for the Advantage 1-75 application has a maximum separation distance between reader and transponder of approximately 40 ft. All readers are of a single design but each performs one of the three or four functions that support the operations of a given weigh station.

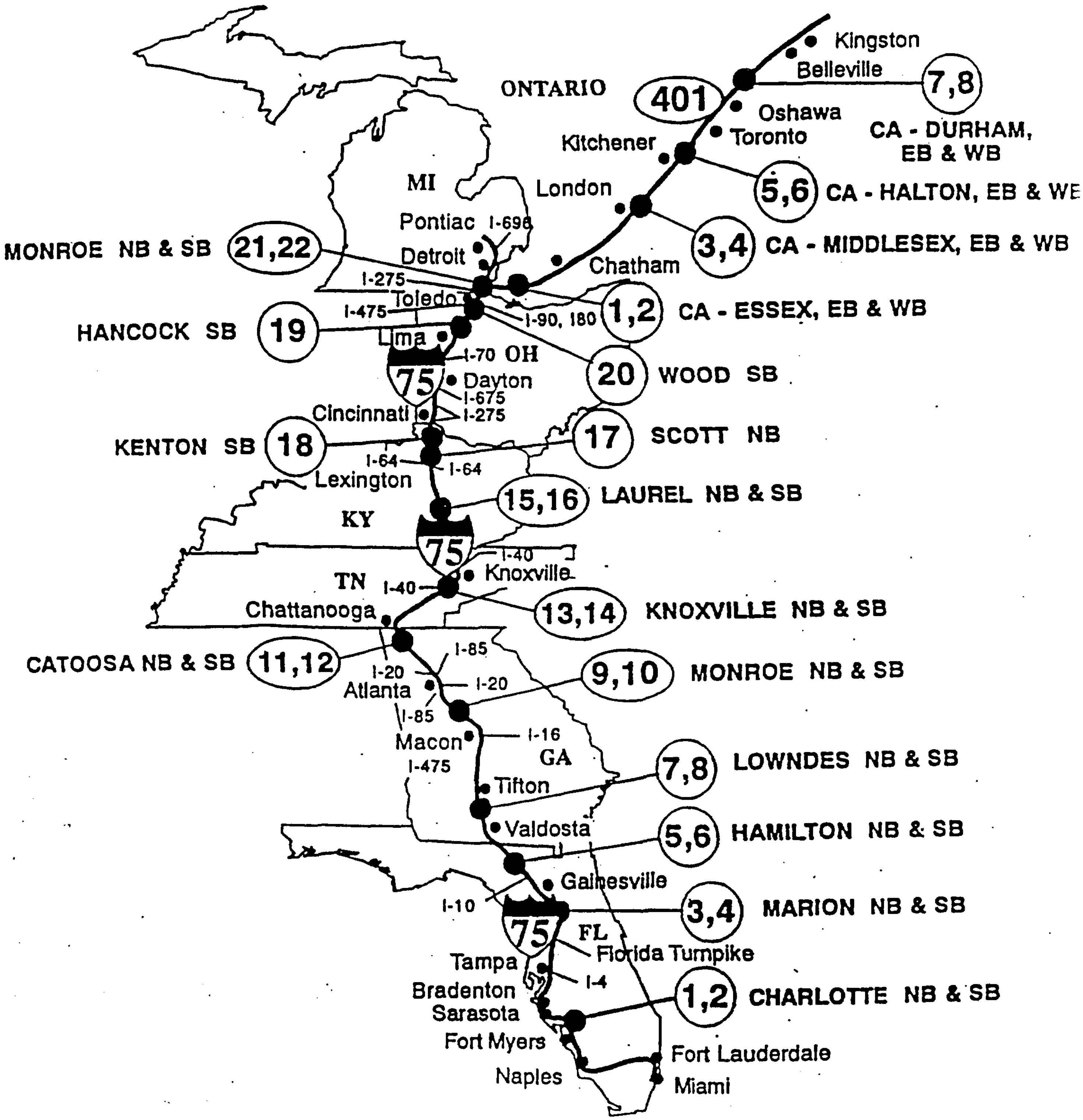
The Advance Reader will be located on the main roadway approximately one-half mile up-highway from the weigh station exit ramp but down-highway from roadside signs directing trucks into a single lane. It repetitively interrogates in a communication zone that encompasses this single truck lane. Based on the information received from a truck transponder entering the zone and command data from the station host, the reader commands the truck-mounted transponder to display either a bypass (truck not required to stop for weighing) or negative bypass (truck required to be weighed) signal to the driver and passes transponder identification, bypass command and trip data to the host system. At certain stations the reader interfaces with a Weigh-in-Motion ("WIM") sensor, which detects moving truck weight. The WIM data must be processed in arriving at the bypass/negative bypass decision, and these data are also passed to the station host.

The Compliance Reader is on the main roadway down-highway from the weigh station exit ramp. The reader is alerted to the proximity of a truck by sensors in each lane of the roadway, and interrogates the truck's transponder. For an authorized bypass, the reader updates the truck's trip packet as received from the station host. Violation reports are formulated for unauthorized bypasses and forwarded along with the transponder identification to the station host. In such cases the reader also sends a violation message to the transponder for storage.

Some weigh stations have a WIM on the station exit ramp, as well as a static scale within the station. For these stations a Ramp WIM Reader is located on the ramp and interfaces with the WIM and the station host. If authorized by the station host, the truck is weighed on the WIM and directed via the transponder to bypass the static scale. The reader also transmits the updated trip packet received from the host to the transponder.

The Static Scale Reader interfaces with the static scale and the station host. The identification and weight data for each truck are passed to the host, and the updated trip packet returned from the host to the reader is transmitted to the transponder.

Figure 1. Map of Locations of Participating Weigh Stations



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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems	)	PR Docket No. 93-61 RM-8013

COMMENTS OF HUGHES AIRCRAFT COMPANY

Hughes Aircraft Company ("Hughes") hereby submits comments in response to the Notice of Proposed Rulemaking in the above-captioned proceeding, 8 FCC Rcd. 2502 (April 9, 1993) (the "NPRM"),[1] released in response to North American Teletrac and Location Technologies, Inc.'s (collectively, "Teletrac") petition for rulemaking filed on May 28, 1992 (the "Teletrac Petition"). Hughes has developed, and is now deploying, a Location and Monitoring Service ("LMS")[2] system called Vehicle to Roadside Communications ("VRC"). VRC falls within the NPRM definition for "narrow-band" LMS systems.

Hughes agrees that it is necessary to revise the interim rules that have governed LMS since 1974. See 47 C.F.R. § 90.239 (1992). As noted in the NPRM, LMS technologies are proliferating rapidly, offering abundant opportunities for future

1. The NPRM was later modified by an Erratum released May 5, 1993.

2. In the NPRM, at page 2503, the Commission proposed to change the name Automatic Vehicle Monitoring service to the Location and Monitoring Service. Hughes supports this proposal, and uses the term "LMS" throughout these comments.

development of innovative commercial products to benefit the public. See NPRM at 2502. A number of LMS systems are already in operation, and many more will be deployed in the near future. The pace of LMS development and the resultant public benefit could suffer, however, due to uncertainty about spectrum allocation and frequency coordination, if new rules for LMS are not adopted expeditiously.

Hughes supports the major proposals in the NPRM, including establishment of a functionally-based channelization plan for LMS, expanded eligibility criteria, and adoption of informal frequency coordination methods. These comments contain recommendations intended to minimize co-channel interference between systems while preserving opportunities to enter the growing LMS marketplace.

First, because some LMS systems that are classified as "narrow-band" in the NPRM are in fact "wide-band" in terms of spectrum usage, and because the vast majority of "narrow-band" uses will operate over ranges of less than 100 meters, Hughes recommends adoption of "local-area" and "wide-area" designations in place of the NPRM's "narrow-band" and "wide-band," respectively.

Hughes also recommends that the Commission adopt limitations on radiated power and antenna height for local-area LMS transmitters, in order to reduce the potential for harmful interference and to facilitate any necessary coordination between neighboring LMS licensees. And, because Hughes' proposed height and power limits would serve to avoid interference among local-area LMS systems, Hughes further recommends that pulse-ranging location systems using less than two megahertz of spectrum, should they be developed in the future, be licensed either in the wide-band, or wide-area, channels or in one of the 902-904 or 926-928 bands proposed for local-area use. Finally, Hughes provides comments on the technical requirements and on certain other proposals contained in the NPRM.

I. THE HUGHES VRC SYSTEM

A basic VRC system employs a base station, or "reader," and tags mounted on the vehicles or other objects to be monitored.[3] A reader generally consists of a transmitter, receiver and antenna installed at the side of the highway segment to be monitored. Each tag contains a low power transponder that receives interrogation or information signals transmitted by the reader, and responds by emitting an identification signal that is picked up by the reader. Hughes' VRC is a local-area system that can operate effectively in the 912-918 MHz band.

For spectral efficiency, VRC technology uses sophisticated time-sharing techniques that enable a single reader to differentiate between and accurately process a large number of responsive signals in a short period of time. Thus, a VRC reader can interrogate, identify, and exchange two-way information with every vehicle in a multi-lane environment using only a single reader, operating on a single frequency, even at high speeds. This will reduce construction and maintenance costs in high-traffic density areas such as toll-plazas and major highway intersections. Multiple VRC readers can be connected to networks for data processing and monitoring at central control points, and

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3. Testing and demonstrations of the VRC system have been conducted by Hughes under experimental license KA2XBX, File No. 2492-EX-PL-92.

tags can be connected to in-vehicle information display equipment. In addition, VRC provides a signal authentication capability to prevent system abuse.

Hughes' VRC projects represent a flexible and innovative approach to meeting the transportation capacity, safety and efficiency goals established in the Intelligent Vehicle-Highway Systems Act of 1991 ("IVHSA"). See 23 U.S.C. § 307 note (Supp. III 1991). By establishing an effective and reliable communications link between moving vehicles and the surrounding infrastructure, Hughes' VRC will be used to promote such IVHSA priorities as automated toll collection, vehicle location and tracking, traffic monitoring and rerouting, and emergency and services availability message dissemination. Hughes' VRC also offers the potential for commercial applications such as automated parking fee assessment and shipping vessel tracking, and is therefore an example of effective transfer of sophisticated communications technology from the aerospace and defense industries to the private sector.

Hughes has recently been awarded a contract to install a network of VRC facilities along Interstate 75, from Florida through Michigan, and along Canada Highway 401 in Ontario. This network will consist of VRC readers, deployed in the vicinity of truck weighing stations, and tags mounted in commercial trucks. As trucks pass through the monitored segment of highway, readers will interrogate tags and transmit individualized messages informing drivers whether they are required to get their trucks weighed at the next weighing station. Drivers informed that they need not stop for weighing will thus avoid unnecessary delay caused by highway exit and reentry and waiting in line at truck scales. By expediting commercial truck movement along this major traffic corridor, the Hughes VRC network will benefit trucking firms, U.S. and Canadian authorities, and the citizens of both countries.

Hughes is also planning for VRC system installations that will improve highway utilization by collecting tolls in an open-road environment, without the need for toll plazas. Additionally, Hughes soon will implement a bus annunciator system using VRC to facilitate public transit agency compliance with the Americans with Disabilities Act, by facilitating use of public transportation by persons that are sight-impaired.

II. DISCUSSION

The new rules for LMS must promote competition and encourage development in the industry by ensuring sufficient spectrum is available for diverse, and, for the most part, yet undefined technologies. This goal can only be attained by balancing broad eligibility criteria with a structured and workable means to avoid harmful interference among LMS systems.

A. Background

In the NPRM, "wide-band" systems are defined as those using transmissions greater than two megahertz to perform "pulse-ranging multilateration," a technique to precisely locate vehicles equipped with tags within a defined geographic area.[4] In pulse-ranging, a pulse is transmitted from the tag and is received by multiple fixed receivers.

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4. Because the Hughes VRC system falls into the "narrow-band" classification of the Commission's proposed rules, and because VRC can operate effectively within the bands set aside for "narrow-band" systems, Hughes does not comment herein on matters related solely to the "wide-band" LMS category. However, Hughes has significant experience developing pulse-ranging multilateration systems for government users, and may address issues regarding such systems in reply to comments of other interested parties.

The time of receipt by the receivers is compared, permitting calculation of location of the vehicle in question. NPRM at 2504. "Narrow-band" systems are defined as all LMS systems that do not meet the above definition of wide-band. Thus, as defined in the NPRM, narrow-band LMS systems comprise both VRC-type technologies, in which tags are interrogated and read when in the vicinity of a reader, and pulse-ranging systems that use less than two megahertz of bandwidth. Id. at 2504-05.

The NPRM contains a proposal to allocate the 904-912 and 918-926 MHz bands for wide-band systems, and to license narrow-band systems at 902-904, 912-918 and 926-928 MHz. Id. The Commission further proposes to limit the maximum effective radiated power ("ERP") of all LMS systems to 300 watts. Id. at 2508.

B. LMS System Categories and Spectrum Allocation Should Be Based on Size of Coverage Area Rather Than Bandwidth

The proposed eligibility criteria for the wide- and narrow-bands are misleading because they do not recognize that some LMS systems not based on pulse-ranging technology are actually wide-band systems. For example, in high-speed, multiple traffic lane environments, Amtech Corporation's ("Amtech") LMS technology "requires access to several megahertz of spectrum." Amtech Opposition to Petition for Rulemaking at 9-10 (July 23, 1992). Similarly, the Hughes VRC system, while capable of reading multiple responses to a single interrogation signal, requires that such signal be greater than two megahertz wide to operate effectively. Thus, some LMS systems to be licensed as narrow-band are actually wide-band systems in terms of spectrum requirements.

Hughes suggests that a more useful and accurate classification of LMS systems is based on the size of the area within which a particular system interrogates and reads corresponding tags. "Wide-area" LMS systems would include those designed to operate over relatively large geographic areas, such as pulse-ranging systems. Typically, such systems would utilize a widely spaced set of receivers.

Conversely, "local-area" systems would only activate tags passing in relatively close proximity to base stations, generally at ranges of less than one hundred meters.[5] Consistent with the NPRM, wide-area systems would be licensed within the 904-912 and 918-926 MHz bands, or, as discussed in proposed rule Section 90.105(b)(3), in bands below 902 MHz for systems that require twenty-five kilohertz or less. See NPRM at 2511. Local-area systems, on the other hand, could effectively share the 902-904, 912-918 and 926-928 MHz bands. As discussed in the next section, the "local" character of such systems would enable them to operate effectively within antenna height and radiated power limits that would greatly reduce the potential for interference.

C. The Commission Should Adopt Radiated Power and Antenna Height Restrictions for Local-area LMS Systems

Many types of local-area LMS systems, including VRC, are designed to function only when tags pass within a short distance of readers. Applications that involve monitoring vehicles passing a particular point on a highway, such as automatic toll collection or traffic management, for example, can operate effectively at a range of no

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5. For consistency, Hughes hereinafter uses "wide-area" to denote LMS systems licensed in the 904-912 and 918-926 MHz bands, and "local-area" to denote LMS systems licensed in the 902-904, 912-918 and 926-928 MHz bands.

more than a few hundred meters. Hughes submits that permitting such local-area users to operate at up to 300 watts, with no limit on transmitting antenna height, may unnecessarily enlarge coverage areas and increase the potential for interference.

While LMS operators are certainly free to reduce transmitter power, Hughes believes that the 300 watt ceiling may only complicate the process of informal coordination by LMS providers attempting to establish new systems in the vicinity of existing ones, especially in light of the expanded eligibility criteria proposed in the NPRM. Accordingly, Hughes recommends that the Commission adopt lower limits on the radiated power and antenna height of the local-area systems, to be licensed at 902-904, 912-918 and 926-928 MHz.

Hughes suggests that local-area LMS transmitters be limited to a 30 Watt ERP and that lower power limits apply to antennas in excess of 15 meters (50 feet) high.[6] Hughes recommends that the Commission include a table showing allowable antenna height/ERP combination in the new rules governing LMS. Based on calculations using the Hata open area model,[7] Hughes believes the following table would be appropriate:

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6. While subject to abuse, using simple height above ground ("HAG") for measuring antenna restrictions results in significant simplification over use of height above average terrain ("HAAT"). Because, in most cases, the motivation behind installing a local-area system with a high HAAT but low HAG would be to obtain extended coverage, the Commission can deal with such applications on a case-by-case basis. Hughes recommends, therefore, that HAG be adopted as the standard for local-area LMS antenna height.

7. See Masaharu Hata, Empirical Formula for Propagation Loss in land Mobile Radio Services, IEEE Transactions in Vehicular Technology, Vol. VT-29, No. 3, August 1980.

Height of Antenna	Maximum Allowed ERP
15 meters or less	30 watts
15-25 meters	15 watts
25-40 meters	5 watts
above 40 meters	1 watt

While these limits will not guarantee that any local-area LMS system will not cause interference to adjacent systems, they make the probability of interference sufficiently low that licensees will be able to more easily resolve interference problems informally, as provided in the NPRM. Further, while local-area licensees may be able to extend coverage to longer ranges than needed to operate and still remain within the above restrictions, Hughes proposes that such licensees not be entitled to protection from other LMS operations or other authorized users of the band at ranges greater than 100 meters.

Hughes believes that adoption of the limits proposed above will not adversely affect existing local-area LMS systems, because those known to Hughes (e.g. automatic toll collection, vehicle entry/exit monitoring, cargo container or railcar monitoring, etc.) operate over short ranges using low altitude antennas, and have ERPs that already conform to the proposed emissions limits.

If the Commission decides not to impose the above limits, or some other restrictions on the extent of LMS system coverage, Hughes believes that the increased potential for unnecessary interference mandates a more formal coordination procedure to ensure sufficient availability of local-area LMS services. In that case, Hughes recommends that LMS applicants be required to notify existing co-channel licensees in the vicinity of proposed systems, and to document in applications that such systems will not cause interference to existing licensed facilities. Further, because of the possible loss of available spectrum for local-area uses caused by unnecessarily large coverage areas, the Commission may be forced to retain the interim rule restriction of use of local-area spectrum to communication only with "vehicles." See 47 C.F.R. § 90.239(a).

The Commission proposes to include pulse-ranging systems using less than two megahertz of bandwidth among systems eligible for licensing at 902-904, 912-918 and 926-928 MHz bands. NPRM at 2505. Hughes is not aware of any existing pulse-ranging technology capable of operation using such a narrow bandwidth. Moreover, Hughes believes it very unlikely that a location system relying on pulse-ranging technology can operate effectively using less than two megahertz of spectrum. This is because location error in such systems is dependent on the error encountered in measuring time of arrival of the pulse at various receiver locations. This time of arrival error generally decreases with increasing bandwidth as well as signal-to-noise ratio. Because of the level of interference from other sources, the degree of error in a pulse-ranging system operating at two megahertz would appear to be commercially unacceptable.[8]

In the unlikely event that future pulse-ranging systems could operate successfully with narrow bandwidths, Hughes recommends that they be licensed in the 904-912 and 918-926 bands, rather than the bands to be reserved for local-area LMS

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8. The Commission will continue to license LMS applicants requiring no more than 25 kHZ of bandwidth at frequencies below 512 MHz. See NPRM at 2511 (proposed rules section 90.105(b)(3). Non-pulse-ranging location systems that rely on the ability of the vehicle to determine its location internally (e.g., using Global Positioning Satellite or other navigation aids) need only to transmit that information to a base station, which can be done using less than 25 kHz, and can thus be licensed in bands below 512 kHz.

systems, as is now proposed. Alternatively, if such systems are incompatible with other wide-area, wide-band LMS operations to be licensed at 904-912 or 918-926 MHz, Hughes recommends that narrow-band pulse-ranging be confined to one of the two-megahertz bands currently proposed for "local-area" use, either 902-904 or 926-928 MHz, with the selected band available to both local-area systems and narrow-band pulse-ranging systems. Otherwise, for the reasons set forth below, there may be undue potential for harmful interference with local-area licensees, and greater difficulty achieving successful coordination.

Most local-area LMS systems can perform effectively over distances of less than several hundred yards. Thus, Hughes' proposed ERP and antenna height limitations, above, are intended to reduce the possibility of interference to other systems by reducing the available maximum coverage area of each system licensed. Pulse-ranging systems, on the other hand, are designed to operate over a wide geographic area using multiple fixed base stations to receive tag signals. It is likely that a large number of licensees will install LMS readers within the area to be covered by a pulse-ranging system. This could easily occur, for example, in the vicinity of major toll facilities or traffic hubs, or in urban areas with large numbers of parking or cargo centers in close proximity. If the pulse-ranging system operates using less than two megahertz, and, as the Commission proposes, is licensed in the same band as the other LMS readers, the probability of harmful interference will increase.

Hughes recognizes that it may be possible to cooperatively reduce interference problems individually between pulse-ranging and short range LMS systems.

However, the likely proliferation of LMS systems in the future will complicate such efforts dramatically, even to the point of making it impossible to deploy some systems, thereby reducing services available to the public. Because, presumably, there will be relatively few pulse-ranging systems licensed in any particular market, those licensees can conduct coordination among themselves without having to deal with the large number of local-area systems likely to operate within their coverage areas. Therefore, the Commission should remove pulse-ranging systems using less than two megahertz from the eligibility criteria for licensing in the local-area bands, or should restrict such systems to one of the two-megahertz bands to be allocated for local-area use, in order to minimize the potential for interference with local-area LMS systems.

D. Technical Requirements

The technical flexibility built into the interim rules was a significant factor in the evolution of LMS technology since 1974. With the development of permanent rules for LMS, however, it is appropriate that stricter technical standards be established to minimize harmful interference. Hughes generally agrees with the proposed technical requirements of the NPRM. See NPRM at 2507-08. As discussed above, however, Hughes believes it is necessary to impose limitations on local-area system radiated power and antenna height.[9]

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9. Hughes notes that applying the 55 + 10 log(P) restriction to tags with transmit powers less than 1 watt results in attenuation requirements that are less than 55 dB. This is appropriate. The 10log(P) term ensures that regardless of how powerful the transmitter, out-of-band emissions are kept down to the same level. While the attenuation required will decrease as the power falls below 1 watt, the absolute level of out-of-band emissions will remain the same. Even if technically feasible, imposing more restrictive suppression requirements on low power tags will add very little to spectrum efficiency while possibly reducing the market for certain LMS services because of

Hughes also believes that the frequency stability requirement imposed on wide-area systems, Id., may result in significant expense with little real impact on spectrum efficiency. Spectrum management benefits of the proposed 0.0005% frequency tolerance for wide-area systems would be minimal. At 915 MHz, a 0.0005% tolerance allows a deviation in frequency of plus or minus 4.6 kHz. In the context of 25 kHz land mobile channels this 9 kHz spread is a significant fraction of the whole channel. In the context of a 8 MHz wide area channel, it is minuscule (0.1%). It would make even less sense to require such tolerances for local-area systems. While the frequency stability of a wide-area system affects spectrum usage in an entire metropolitan area, frequency stability of a single local-area system would have a minor impact, and that only in the immediate vicinity of the base station.

The cost of the frequency stabilizing circuitry required to meet the 0.0005% tolerance could easily exceed the total cost of a typical tag by a substantial margin, especially for low-powered tags. Accordingly, from a cost-benefit standpoint, the Commission should not impose a frequency stability requirement on local-area systems.

E. Additional Comments

1. Coordination With NTIA

Hughes notes with some concern that the Commission has yet to complete the coordination process concerning 902-903, 912-918 and 927-928 MHz with the National Telecommunications and Information Administration ("NTIA"). NPRM at

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increased tag expense.

2504-05.[10] In the event that such coordination proves unsuccessful, and, as a result, allocation for all LMS systems is limited to spectrum previously available under the interim rules for AVM, Hughes recommends that the Commission allocate one of the eight megahertz blocks proposed for wide-area use to local-area LMS services. Alternatively, if LMS spectrum is to be shared by both wide- and local-area users, Hughes recommends adoption of formal coordination procedures such as those described in Section C., above.

2. Interference from Other Authorized Uses

As discussed in the NPRM at page 2506, interference from Industrial, Scientific and Medical ("ISM") devices, government systems, amateur radio, and Part 15 operations can significantly affect wide-area systems, particularly where such a source is much closer to the receiver than is the transmitting tag. In contrast, local-area LMS tags will generally be closer to the reader than the source of an interfering signal. Local-area system operators will also have more control over where and in what direction receive antennas are located, and, as Hughes recommends, will be subject to restrictions on antenna height and radiated power, resulting in shorter range signals. As a result, interference should be a relatively rare event for local-area systems.

In view of the relative unlikelihood of interference from other users of the local-area, Hughes submits that requiring a warning to consumers is unnecessary. Requiring local-area licensees to conform to labelling requirements of Section 90.105(e)

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10. Hughes agrees with the Commission's decision to take into account the results of this proceeding when it takes action on the petition for rulemaking filed by Radian Corporation, seeking allocation of 908.75-921.25 MHz for use in wind profile radar systems, and the associated Notice of Inquiry. NPRM at 2505 n. 33.

of the proposed rules would likely result in needless expense and confusion among members of the public. Accordingly, Hughes recommends that Section 90.105(e) be modified so as to expressly apply only to wide-area systems.

3. Construction Period

Hughes supports retention of the eight month construction deadline from date of grant of the license. See NPRM at 2507. This will ensure that licensees begin providing service to the public, and prevent "warehousing" of channels at desirable locations. Because Hughes anticipates that the majority of large-scale local-area LMS systems, such as toll plazas and traffic monitoring networks, will be licensed to local government entities, the local government exception of Section 90.155(b) of the Commission's rules is sufficient to simplify the application and licensing process for such projects. For systems in the private sector, on the other hand, Hughes believes that imposing a realistic construction schedule will facilitate the informal coordination methods, proposed by the Commission, by restricting LMS systems that must be coordinated to those that are actually in operation or that are within eight months of completion.[11/]

4. Blanket Licensing of Tags

Hughes proposes that the new rules include language to indicate that corresponding tags are covered under the license issued for a particular LMS system. Blanket licensing of tags with corresponding readers will reduce unnecessary

11. Hughes notes that it is possible that waivers of the construction period may be appropriate for private toll roads, or for other private, large-scale projects involving multiple local-area LMS installations that are subject to schedule changes as part of a larger construction project.

administrative burden for both the Commission and LMS applicants. Cf. Specialized Mobile Radio Systems, 7 FCC Rcd. 5558, 5559 (Comm'n 1992) (blanket licensing of SMR end users with base stations "save[s] significant end user time, money and resources, while also reducing substantially the Commission's administrative costs and efforts"); Interactive Video and Data Services, 7 FCC Rcd. 1630, 1639 (Comm'n 1992) (blanket licensing of IVDS response and interrogator units). Blanket licensing should generally apply equally to wide- and local-area LMS systems.

In the case of tags that contain active transponders or transmitters, blanket licensing should be adopted only where tags are designed not to transmit except when under the control of an appropriate base station. That is, when the tag in question is receiving or has recently received a signal from a reader authorizing tag transmissions.

For tags that can be activated irrespective of location or illumination by the appropriate reader, either manually or spontaneously, individual licensing of tags should be considered in order to reduce the risk of emissions outside the area covered by the system license. To ensure that active tags do not emit signals causing interference outside of authorized frequency bands, Hughes recommends that tag emissions be subject to the same attenuation requirements applied to base stations in the proposed rules. See NPRM at 2508.

III. CONCLUSION

Adopting permanent rules for LMS will promote continued growth in this important new telecommunications industry. By adopting Hughes proposals for separate allocation for wide- and local-area LMS services, placing height and power limits on local-area systems and licensing pulse-ranging systems that use less than two megahertz bandwidth separately from local-area systems, the Commission can establish a regulatory regime that ensures flexibility needed to promote innovation, while protecting beneficial LMS services from harmful interference in the future.

Respectfully submitted,

HUGHES AIRCRAFT COMPANY

By: ______________________

Gary M. Epstein
Raymond B. Grochowski
LATHAM & WATKINS
1001 Pennsylvania Ave., N.W.
Washington, D.C. 20004

Consulting Engineer:
Paul J. Fox, P.E.
Telecommunications Directions
1000 Connecticut Ave., N.W.
Washington, D.C. 20036

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EX PARTE OR LATE FILED

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems	)	PR Docket No. 93-61 RM-8013

REPLY COMMENTS OF HUGHES AIRCRAFT COMPANY

Gary M. Epstein
Raymond B. Grochowski
LATHAM & WATKINS
1001 Pennsylvania Ave., N.W.
Washington, D.C. 20004

Consulting Engineer:
Paul J. Fox, P.E.
Telecommunications Directions
1000 Connecticut Ave., N.W.
Washington, D.C. 20036

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SUMMARY

Hughes Aircraft Company supports the Commission's proposal to limit the potential for harmful interference between different types of LMS systems by licensing them in separate bands within 902-928 MHz. In its comments in this proceeding, Hughes recommended that the Commission differentiate between types of LMS systems based on function and coverage area, with non-pulse-ranging, "local-area" systems authorized in the 902-904, 912-918 and 926-928 MHz bands. Hughes also proposed that the Commission establish radiated power and antenna height limits for such local-area systems, as a means to minimize risk of co-channel interference and facilitate informal coordination among licensees. These measures will also significantly reduce the chance of harmful interference between local-area LMS systems and other users of the band, such as Part 15 devices and amateurs. Several other commenters have made similar suggestions.

In these reply comments, Hughes joins other commenters in recommending a field strength limit, in conjunction with power/height limits, to give local-area system designers flexibility in circumstances requiring power or height in excess of prescribed maximum values. Hughes also recommends that the Commission not adopt separation distances or frequency tolerances for local-area systems, as proposed by other commenters. Such measures may reduce available LMS services or add to system costs, while providing little or no actual benefit. Finally, Hughes addresses certain technical issues raised in other comments, including proposals to reduce band-edge suppression requirements, to specify power limits for pulse-ranging LMS operations, and to set a limit on the duty cycle for wide-area LMS transponders.

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